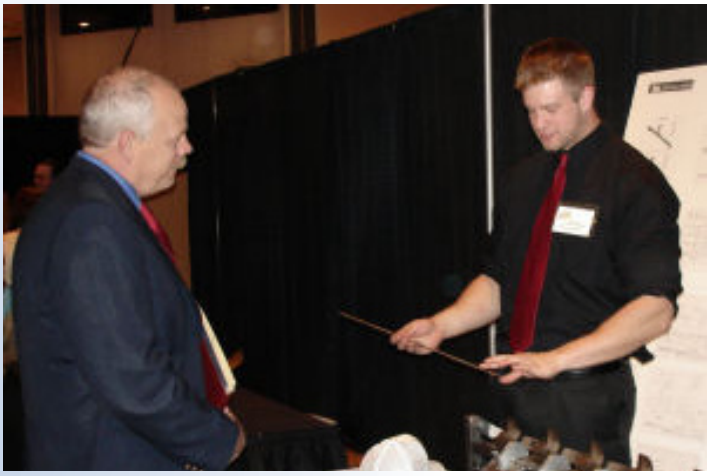
CAES Quarterly Report

FY- 2007 | *Quarterly Period Starting 1 April 2007 through 30 June 2007* | 3rd Quarter

Highlights From the Director's Desk

CAES Supports University of Idaho Celebrating 100 Years of Engineering

The Center for Advanced Energy Studies celebrated the University of Idaho's centennial of engineering, April 27 on the Moscow, Idaho campus. CAES sponsored an engineering Expo, joining Micron, Itron, Schweitzer Engineering Laboratories and several other high technology enterprises to support Idaho engineering students. Harold Blackman, CAES director, and Kevin Kostelnik, CAES Deputy director, served as judges of the more than 60 projects. Winners were announced at an award ceremony at the end of the Expo. Kostelnik presented Dean Elshabini with a special banner that highlights the four CAES partners - Boise State University, Idaho State University, Idaho National Laboratory, and the University of Idaho.



CAES Director Harold Blackman listens to University of Idaho Engineering students who worked with INL engineers at the Materials and Fuels Complex to design a tool that will cut fuel rods for further processing.

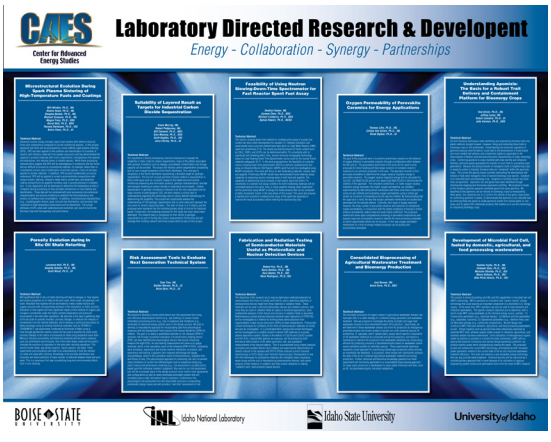
ENERGY WATER Connections

Energy-Water Nexus: Meeting the Energy and Water Needs of the Snake/Columbia River Basin in the 21st Century

The Center for Advanced Energy Studies joined forces with six other entities to organize this summit to help shape the future of water and energy resources of the Snake/Columbia River Basin. The summit was held in Boise, Idaho on June 25 and 26.

Laboratory Directed Research and Development (LDRD): a CAES Enterprise

The Center for Advanced Energy Studies awarded a total of $1M to 11 teams of scientists and Idaho university faculty to conduct preliminary research in support of its Energy initiative. Read further details in the Research Program Status section of this report.



CAES, INL host faculty partners during workshop

Fifty five research faculty members from Boise State University, Idaho State University and the University of Idaho were hosted by the Center for Advanced Energy Studies at the Idaho National Laboratory for a day-long workshop and laboratory tour. The purpose of the workshop was to familiarize university research faculty with INL principal investigators, facilities, equipment, and ongoing energy research programs; facilitate networking between the four CAES member institutions; and identify additional collaborative opportunities. CAES Associate Director for Research and University of Idaho Associate Vice President Bob Smith noted, "By coming to INL they (university faculty) will be able to carry what they have learned to their respective institutions, other faculty and students."

CAES Associate Director for Energy Policy and Boise State faculty member John C. Freemuth hosted a one-hour energy policy forum after the tours. He said, "What was most exciting about our forum was the interaction between research scientists and those of us who study public policy, made possible by the growing collaboration among the three Idaho universities via CAES."

CAES Associate Director for Education and Idaho State Dean of Academic Programs in Idaho Falls John Knox said, "I was particularly impressed with the number of people attending and the quality of the participation at the

energy policy forum."

CAES Deputy Director, Kevin Kostelnik thanked the many participants from INL and Academia and described a path forward to continue enhancing collaboration on a strategic and proactive approach. As a result from this tour, INL researcher's prepared and submitted several joint proposals.

Path Forward

During the last quarter of FY2007, CAES will:

- Complete an implementation and strategic plan that identifies specific steps to enhance collaboration between the INL and the Idaho Universities.
- Complete the FY-2007 work of the 11 CAES LDRDs.
- Complete the CAES Strategic Business Plan including specific scope, deliverables, and milestones.
- Obtain approval from the Idaho State Board of Education for the construction of the CAES building.
- Begin excavation and construction of the CAES building.
- Update CAES building strategy including scope, schedule, budget.
- Begin writing the CAES facilities management plan.
- Complete planning for FY-2008.

Quarterly Highlights

Infrastructure Management:

The Idaho State Department of Education received all information required for construction approval. A decision of official approval for construction is expected in early July. When completed in August 2008, the CAES research laboratory will provide modern state-of-the-art laboratories for CAES collaboration.

BSU Material Laboratory upgrades during this reporting quarter included an MTS 810 hydraulic system, a multi-wavelength particle size analysis system, and a precision saw for processing refractory materials exposed to UCl3-based pyro-processing salts.

BSU and INL received joint LDRD funding for a new spark plasma sintering system and gloveboxes to be installed in the new and upcoming CAES building.

University of Idaho purchased and received a Shimadzu 2010 gas chromatograph (GC), at the Center for Higher Education (CHE) Chemistry building in Idaho Falls. The GC will be used for species and concentration identification and will be relocated to the CAES building next summer.

Collaborative Relations:

CAES sponsored an Advanced Fuel Cycle Workshop at BSU May 8–9, 2007, a key deliverable of the Idaho Academic Center of Excellence. Over 60 national experts attended the workshop. Participants developed several technical proposals that have been submitted to the DOE-NE for consideration in its Nuclear Energy Research Initiative (NERI).

CAES sponsored a conference "Energy/Water Science and Technology Summit—Transforming Science and Technology to Meet the Needs of the Snake/Columbia River Basin in the 21st Century" in Boise, ID, June 25– 27, 2007.

Research Programs:

As reported in the Director's Highlights section above, CAES awarded $1M to eleven LDRD efforts, with titles of research, affiliation of each collaborators and their names as follows:

Microstructural Evolution During Spark Plasma Sintering of High-Temperature Fuels and Coatings – INL: Will Windes, Ph.D., Steven Howe, Ph.D., Douglas Burkes, Ph.D., Michael Simpson, Ph.D. – BSU: Megan Frary, Ph.D., Darryl Butt, Ph.D. – ISU: Thomas Hartmann, Ph.D – U of I: Batric Pesic, Ph.D.

Suitability of Layered Basalt as Targets for Industrial Carbon Dioxide Sequestration – INL: Travis McLing, Robert Podgorney – BSU: Bill Clement, Ph.D., Sian Mooney, Ph.D. – ISU: Scott Hughes, Ph.D. – U of I: Jerry Fairley, Ph.D.

Feasibility of Using Neutron Slowing-Down-Time Spectrometer for Fast Reactor Spent Fuel Assay – INL: DeeEarl Vaden – ISU: Jianwei Chen, Ph.D., Michael Lineberry, Ph.D. – North Carolina State University: Ayman Hawari, Ph.D.

Oxygen Permeability of Perovskite Ceramics for Energy Applications - INL: Thomas Lillo, Ph.D., Clinton Van Siclen, Ph.D. – U of I: Vivek Utgikar, Ph.D.

Understanding Apomixis: The Basis for a Robust Trait Delivery and Containment Platform for Bioenergy Crops – INL: Tom Ulrich, Ph.D., Jeffrey Lacey – U of I: Robert Zemetra, Ph.D. – Utah State University: John Carman, Ph.D.

Porosity Evolution during In Situ Oil Shale Retorting – INL: Laurence Hull, Ph.D., Annette Schafer, Ph.D. – U of I: Scott Wood, Ph.D.

Risk Assessment Tools to Evaluate Next Generation Technical System – INL: Tuan Tran, Ph.D. – U of I: Steffen Werner, Ph.D., Brian Dyre, Ph.D.

Fabrication and Radiation Testing of Semiconductor Materials Useful as Photovoltaic and Nuclear Detection Devices – INL: Robert Fox, Ph.D., Harry Rollins, Ph.D. – ISU: Kara Keeter, Ph.D., Rene Rodriguez, Ph.D.

Consolidated Bioprocessing of Agricultural Wastewater Treatment and Bioenergy Production – INL: Joni Barnes – BSU: Kevin Feris, Ph.D.

Development of Microbial Fuel Cell, fueled by domestic, agricultural, and food processing wastewaters – INL: Yoshiko Fujita, Ph.D. – ISU: Chikashi Sato, Ph.D., Malcolm Shields, Ph.D., Marco Schoen, Ph.D., Alba Perez-Gracia, Ph.D.

Investigation of Public Discourse Methods in Energy Policy Decision-Making – INL: Steve Piet, Ph.D. – BSU: John Freemuth, Ph.D. – ISU: Ann Oakes Hunter, Ph.D. – U of I: Patrick Wilson, Ph.D.

Educational Programs:

Boise State University welcomed to their CAES-sponsored faculty:
Dr. Frederick Ubic from Queen Mary University, London who brings extensive expertise on Electron Microscopy;
Dr. Darryl P. Butt, who brings strong expertise on Nuclear Fuels Development; and
Dr. Megan Frary, whose research will focus on Crystallographic-Texture Effect on Nuclear Alloys.

BSU also sponsored three students:
Patrick Callahan, M.S. candidate on Nuclear Fuels Development;
Lou Bonfrisco, M.S. candidate on Crystallographic-Texture Effect on Nuclear Alloys; and
Brandon Christopherson, undergraduate to support Nuclear Fuels Development.

Idaho State University supported three faculty members in varying degrees of funding:
Dr. Patricia Paviet-Hartmann, Research Associate Professor of Nuclear Engineering, who will collaborate with INL's Dr. Terry Todd on fuel separation chemistry;
Dr. Jianwei Chen, tenure –track Assistant Professor of Nuclear engineering, who will work with INL's Dr. Hans Gougar and Dr. Abderaffi Ouagag on gas-reactor physics methods; and
Dr. Thomas Hartmann, Research Associate Professor, who will collaborate with INL's Dr. Rory Kennedy on post-irradiation examination of nuclear fuels and materials, and specifically on upgrades to examination equipment in the Hot Fuel Examination Facility (HFEF) at INL.

University of Idaho hired 3 tenure-track faculty members:
Dr. Akira Tokuhiro from Kansas State University, who will join the Nuclear Engineering Program of the Department of Mechanical Engineering this August in Idaho Falls as an Associate Research Professor within the College of Engineering. He brings expertise in fast nuclear reactor thermal hydraulics and liquid metal instrumentation & measurements;
Dr. Indrajit Charit from North Carolina State University, who will join the Department of Materials Science and Engineering (MSE) this August as an Assistant Research Professor within the College of Engineering at the University of Idaho–Moscow. He brings an expertise in high-temperature nuclear materials; and
Dr. Supathorn Phongikaroon from the Idaho National Laboratory, who joins the UI College of Engineering faculty in Idaho Falls as an Assistant Research Professor of Chemical Engineering. He brings an expertise in nuclear materials separations and electrorefining.

U of I also sponsored five students to work with their corresponding faculty members:
Lucus J. Fowler, 05/12/2007-18 months, nuclear materials / separations; Faculty: B. Pesic
Charlotte McMurtrey, 01/28-open, chemical engineering lab assistant; Faculty: V. Utgikar

Christopher Haynes, 05/14-open, materials melt & solidification project; Faculty: J. Crepeau
Jared Daniels, 05/14-06/09, materials melt & solidification project; Faculty: J. Crepeau
Piyush Sabharwall, Ph.D. Candidate, 01/03/2007 – open / NGNP Process Heat Removal; Faculty: F. Gunnerson

University of Idaho offered the course "Nuclear Materials" (UI02-3credits) from Idaho Falls via compressed video to Pocatello and Moscow; Spring 2007. Instructors from U of I, INL, ISU, and BSU participated in this course.

Policy Programs:

CAES hosted a one-day INL tour for Idaho university faculty. After the tours were completed, CAES Associate Director for Energy Policy and Boise State faculty member John C. Freemuth hosted a one-hour energy policy open forum at the Shilo Inn in Idaho Falls. Over 40 faculty attended the forum and participated enthusiastically. The forum yeilded a list of 30 suggestions to the Energy Policy Institute to guide its strategy in the upcoming months.

The Energy Policy Institute (EPI) expects to hire 2 new faculty members (Assistant Professor and an Associate Director) to start in August 2008. Both positions will focus their research on Energy/ Environmental Public Policy.

BSU's Ira Bunch will focus his research on the State of Idaho Energy Policy. He is also developing the EPI website in collaboration with the CEAS portal project.

Eileen DeShazo was assigned to EPI from August 2006 until May 2008. Her research will focus on determining public acceptance of nuclear energy and the Global Nuclear Energy Partnership (GNEP) program.

EPI presented study results of Idahoans attitudes and beliefs on issues of energy policy to senior executives at Idaho Power, Inc.

Program Development:

CAES received $450K from DOE-NE to further support CAES partners. With this funding, Boise State University, Idaho State University and the University of Idaho will continue to expand their efforts in nuclear engineering and other energy-related disciplines. CAES anticipates an additional $550K in the final quarter of FY07.

CAES was awarded $200K by the DOE Biomass Program (DOE-EE/RE) to develop "sustainable" harvest indicators and model the system dynamics associated with "Food versus Fuel" issues.

Idaho State University's Energy System Technology Education Center (ESTEC) received an award of $568K from the National Science Foundation. Both the original ESTEC U.S. Department of Labor grant ($1.96M) and this new funding were secured with CAES support in collaboration with ISU faculty partners and Partners for Prosperity.

Scientific Eminence

Publications:

Boise state professor Darryl Butt's team developed a novel material processing method. A publication, *Room Temperature Reactive Milling Method for Synthesizing Nitride Nuclear Fuel Powders*, is currently under development for the Journal of Nuclear Materials.

University of Idaho's P. Sabharwall, S. Sherman, V. Utgikar and F. Gunnerson presented *Alternative In-*

termediate Heat Exchanger Design for Nuclear Hydrogen Production at the ANS Annual Meeting, Boston, MA, June 24-28, 2007.

Professional Contributions:

CAES Deputy Director, Kevin Kostelnik, Ray Grosshans (CAES staff), and Jacob Jacobson (INL Modeling and Measurement) co-authored a technical paper entitled, *Sustainable Harvest for Food and Fuel*, and presented it at the 49th Annual meeting of the Idaho Academy of Science. This paper will be published in the Academy's refereed Journal.

CAES staff member Ray Grosshans coauthored a technical paper with Roger Mayes and Richard Holman (INL Education Programs) entitled "Who, from Where, and When: Strategic Thinking about the Next Nuclear Workforce" which was presented at the American Nuclear Society 2007 Annual Meeting.

Recognitions, Awards, Officers in Professional Societies, others.

Michael Louis, Assistant Director of the Energy Policy Institute serves on the Governor of Idaho's 25 x 25 Renewable Energy Council.